



# RF



ORANGE COUNTY AMATEUR RADIO CLUB, INC.

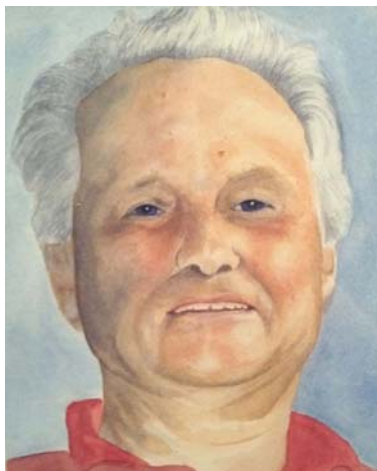
VOL. LIV NO. 7

P.O. BOX 3454, TUSTIN, CA 92781-3454

July 2013

## The Prez Sez.....

by Nicholas AF6CF



This ARRL Field Day was spectacular, and a good celebration of our 80<sup>th</sup> Anniversary. Thanks to all FD participants we had another successful Field Day!

Safe, High scores, Dignitaries, PR success. We could not ask for more (other than propagation?). This effort will not be soon forgotten, and I sincerely hope that we started a trend this time. All the visitors were impressed with the setup and operations, and I feel that we have attained our objectives of a "monster" operation and a Public Relations event. We also had a few new hams and upgrades with the WARA VE session. A special thanks to the event Chairpersons, Band Captains and Food, GOTA and PR persons.

The Club owes you all their gratitude. I know that you all contributed more than a fair share of your time and money to make this a total success that will be used as an example of how Field Day should be conducted in the future. Speaking of scores, the preliminary QSO results are listed on Page 5. Bonus Points are still being tallied so we will have them ready for the next edition. This month we will have more great activities with a great speaker about the newest micro-processors in the block, Arduino and Picaxe and don't forget our September Anniversary party. I look forward to an eyeball contact with you all at the next General Meeting.

Again, thanks to all.  
73 DE AF6CF

### General Meeting Friday July 19

"PICAXE / Arduino Ham Radio Projects"

Bill Prats - K6ACJ will talk on PICAXE / Arduino. The PICAXE is a series of microcontroller chips that are easily programmed using free, easy-to-learn software. These chips can become the "brain" of your project. The Arduino is a series of flexible, open source, prototyping platforms that can be used for many different control and sensing applications. Bill will be showing us these devices and their use in ham radio. Bill will also introduce us to the new "Raspberry Pi". Don't know what that is? **Come find out!**



The next general meeting will be on:

**Friday, July 19th  
@ 7:00 PM**

As usual, we will be meeting in the east Red Cross Building, Room 208. See you there!

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AMATEUR RADIO CLUB**  
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Submit Articles:  
[editors@W6ZE.org](mailto:editors@W6ZE.org)

**Monthly Events:**

**General Meeting:**

Third Friday of the month  
at 7:00 PM  
American Red Cross  
600 Parkcenter Drive  
(Near Tustin Ave. & 4<sup>th</sup> St.)  
Santa Ana, CA

**Club Breakfast:**

Second Saturday of every  
month at 8:00 AM  
Jagerhaus Restaurant  
2525 E. Ball Road  
(Ball exit off 57-Freeway)  
Anaheim, CA

**Club Nets (Listen for W6ZE):**

28.375 ± MHz SSB  
Wed- 7:30 PM - 8:30 PM  
Bob AF6C, Net Control

146.55 MHz Simplex FM  
Wed- 8:30 PM - 9:30 PM  
Bob, WB6IXN, Net Control

7.086 ± MHz CW **OCWN**  
Sun- 9:00 AM – 10 AM  
John WA6RND, Net Control

**VISIT OUR WEB SITE**

<http://www.w6ze.org>

for up-to-the-minute club  
information, the latest  
membership rosters, special  
activities, back issues of RF,  
links to ham-related sites,  
vendors and manufacturers,  
pictures of club events and much  
much more.

**Club Dues:**

Regular Members	...\$20
Family Members*	...\$10
Teenage Members	..\$10
Club Badge**	.....\$3

Dues run from Jan thru Dec and are  
prorated for new members.

\*Additional members in the family of  
a regular member pay the family rate  
up to \$30 per family.

\*\*There is a \$1.50 charge if you'd  
like to have your badge mailed to  
you.



# OCARC Field Day 2013

## Walter Knott Education Center - Buena Park



(Collage by Ken W6HHC)



Photo courtesy of Richard K6RBS-GØERY

## ***OCARC 2013 Field Day Quotes***

***"This year most of my operating time was replaced by my supporting the visitor's tent. Meeting and greeting numerous visitors, want-a-be hams, and even the director of the local FCC office was very rewarding."*** Bob Eckweiler- AF6C

***"If you attended the OCARC Field Day and didn't sign in at the visitor's booth, you weren't really there!"***  
Anonymous

***"My first time camping-out for Field Day! Everything went perfectly."*** Corey Miller - KE6YHX

***"I have been a ham for 50 years, this was my first field day adventure - awesome! OCARC Field Day Rocks!"*** Greg Bohning - W6ATB

***"The 2013 W6ZE Field Day effort was a tremendous demonstration of teamwork and initiative. I've never seen so many people setting out to do a task that needed to be done without anyone having to ask them to do it. Bravo!"*** Chip Margelli – K7JA

***"With the spirit of teamwork and cooperation, we accomplished a momentous task - to put 14 stations on the air in a big way. Everyone has a unique skill or talent, and they all were brought together to make this the best Field Day ever. Thanks to our leaders Bob AA6PW, Dino KX6D and Chip K7JA for their excellent leadership."*** Tim Goeppinger – N6GP

***"What a great Field Day operating 12A plus GOTA. I have never seen such a large effort with 19 towers (holding more than 19 antennas) including the 106 ft. tower Dino brought....plus a 75M vertical"***  
Ken Konechy – W6HHC

FIELD DAY SUMMARY  
FOR  
THE ORANGE COUNTY AMATEUR RADIO CLUB - W6ZE  
by: Ken / W6HHC & Bob / AF6C

YEAR	160M SSB	80M CW	75M SSB	40M CW	40M SSB	20M CW	20M SSB	15M CW	15M SSB	12M SSB	10M CW	10M SSB	6M CW	6M PHN	2M CW	2M PHN	220 PHN	440 PHN	UHF CW	UHF PHN	ATV	RTTY/PSK Dig	SAT- ELLITE	GOTA	---- TOTAL ----	
																									QSO's	/ (POINTS)
2013	0	269	339	655	1052	895	1960	484	614	0	38	67	6	60	0	60	15	11	0	0	0	144	4	186	6,859	/ 18,700
2012	0	14	51	125	78	215	735	185	330	0	0	12	1	50	0	37	5	5	0	0	0	13	0	408	2,264	/ 5,634
2011	0	58	176	168	217	253	703	32	198	0	16	40	0	57	0	37	0	16	0	0	0	0	0	139	2,110	/ 5,278
2010	0	0	0	240	342	223	727	49	0	0	0	0	1	96	0	32	1	7	0	0	0	0	0	160	1,878	/ 4,786
2009	0	277	126	838	807	974	970	495	368	0	5	450	11	375	0	125	18	20	1	0	0	0	2	130	5,992	/ 17,446
2008	0	179	204	690	405	411	878	141	43	0	22	68	15	135	0	34	2	14	0	3	0	0	5	16	3,265	/ 9,468
2007	1	356	310	910	830	988	1285	381	320	0	18	150	9	145	2	175	40	70	2	9	0	2	11	142	6,156	/ 17,648
2006	0	28	20	89	512	156	664	16	10	0	0	0	0	38	1	85	0	7	0	0	0	114	0	113	1,853	/ 4,514
2005	0	113	6	158	481	337	534	122	17	0	0	0	0	74	0	36	16	20	0	0	0	0	0	31	1,945	/ 5,350
2004	0	166	239	37	412	131	477	31	105	0	1	114	0	0	0	46	12	20			0	0	1	0	1,792	/ 4,316
2003	0	0	85	52	127	27	295	0	191	0	0	41	0	52	0	64	1	13			0	0	0	0	948	/ 2,054
2002	0	26	69	192	279	76	229	0	485	0	0	18	0	62	0	68	6	10			3	2	0	3	1,528	/ 3,648
2001	0	0	25	101	251	0	432	0	675	0	0	109	0	48	0	28	1	0			0	0	3	-	1,673	/ 3,548
2000	0	19	20	88	91	0	625	0	794	0	0	121	0	36	0	72	7	15			0	0	1	-	1,889	/ 3,992
1999	0	13	20	15	237	0	996	0	724	0	0	22		5	0	2	0	0			0	0	0	-	2,034	/ 4,124
1998	0	24	75	65	136	100	250	0	624	0	0	82		0	0	46	17	12			0	7	1	-	1,439	/ 3,270
1997	5	81	131	83	306	150	853	14	275	0	0	106		32	0	79	4	0			0	32	1	-	2,152	/ 5,024
1996	-	146	228	104	125	283	673	40	605	0	0	217		121	0	32	0	40			0	13	1	-	2,628	/ 6,428
1995	-	145	272	203	94	443	572	51	451	0	0	131		66	0	93	29	8			0	33	6	-	2,597	/ 6,944
1994	-	114	114	208	45	486	748	85	761	0	13	312		58	0	94	33	0			0	31	0	-	3,102	/ 8,078
1993	-	150	100	159	81	530	700	131	812	0	0	179		40	0	86	12	16			0	35	0	-	3,061	/ 8,132
1992	-	0	294	200	110	541	555	0	840	0	0	232		13	0	74	0	1			2	41	80	-	2,983	/ 7,530
1991	-	105	308	182	182	400	623	9	463	0	0	104		4	0	141	23	11			0	48	0	-	2,626	/ 6,740
1990	-	0	0	70	144	0	370	0	747	0	0	131		39	0	114	14	26			0	2	-	-	1,657	/ 3,454
1989	-	30	0	98	5	0	906	21	172	0	0	238		3	0	121	24	9			1	18	-	-	1,646	/ 3,590
1988	-	127	0	93	75	2	359	0	570	0	144	81		0	0	32	0	-			-	14	-	-	1,497	/ 3,726
1987	-	22	0	0	39	0	708	0	18	1	117	0		1	0	51	0	-			-	5	-	-	962	/ 2,202
1986	-	0	46	219	78	0	488	0	45	10	0	0		0	0	82	0	-			-	0	-	-	968	/ 2,374
1985	-	85	0	315	91	35	662	78	0	-	0	0		0	0	22	0	-			-	-	-	-	1,288	/ 3,602
1984	-	18	0	313	0	32	196	32	350	-	0	0		0	0	0	0	-			-	-	-	-	941	/ 2,672
1983	-	3	93	200	0	0	776	0	995	-	0	43		18	0	16	1	-			-	-	-	-	2,145	/ 4,696
1982	-	0	105	59	238	40	352	19	515	-	0	72		0	0	155	27	-			-	-	-	-	1,582	/ 3,400
1981	-	0	167	200	265	60	699	77	717	-	0	105		0	0	197	0	-			-	-	-	-	2,487	/ 5,648
1980	-	20	149	205	235	471	318	52	1,025	-	0	226		12	0	100	36	-			-	-	-	-	2,849	/ 7,194
1979	-	0	195	198	92	42	773	0	737	-	0	95		0	2	124	8	-			-	-	-	-	2,266	/ 5,016
1978	-	16	196	246	170	30	981	57	558	-	13	145		0	1	164	23	-			-	-	-	-	2,600	/ 5,926
1977	-	25	243	182	199	0	843	81	486	-	4	309		0	4	234	0	-			-	-	-	-	2,610	/ 5,812
1976	-	99	254	152	487	21	600	64	210	-	2	54		0	0	2	0	-			-	-	-	-	1,945	/ 4,566
1975	-	80	120	154	274	40	863	140	259	-	0	123		0	0	0	0	-			-	-	-	-	2,053	/ 4,934
1974	-	6	161	6	333	0	630	12	342	-	0	110		0	0	0	0	-			-	-	-	-	1,600	/ 3,248
1973	-	90	226	0	452	0	932	0	273	-	0	0		0	0	46	0	-			-	-	-	-	2,019	/ 4,218
1972	-	0	50	0	350	0	521	0	530	-	0	0		0	0	94	0	-			-	-	-	-	1,545	/ 3,090
1971	-	0	274	0	106	0	530	0	136	-	0	0		0	0	0	0	-			-	-	-	-	1,046	/ 2,092
1970	-	0	272	0	0	0	531	0	426	-	0	0		0	0	0	0	-			-	-	-	-	1,229	/ 2,458
1969	-	0	98	0	50	0	375	0	301	-	0	0		0	0	169	0	-			-	-	-	-	993	/ 1,986
1968	-	10	224	62	396	93	328	24	430	-	0	68		0	0	145	0	-			-	-	-	-	1,780	/ 3,938

Note: These are raw contacts taken directly from the log sheets. Adjustments have not been made for duplicate contacts, and bonus points have not been added yet. Final scores appear in QST.



## WWII and OCARC Field Days – A Shared History – Part 1

Expanded coverage from the “History Minute” at the June OCARC Meeting

It is not by chance that OCARC has chosen former WWII sites for our field days. Many of our club members are veterans, and many of them have had and still have close ties to the military. By a show of hands, we would estimate that half of those in attendance at the June meeting are veterans, and we salute you.

Here is a summary of the W6ZE Field Day sites that contributed to our victory in WWII:

### El Toro Marine Air Station - W6ZE Field Day 1981



Built in 1942, El Toro became the largest Marine Air Station on the West Coast in 1944.

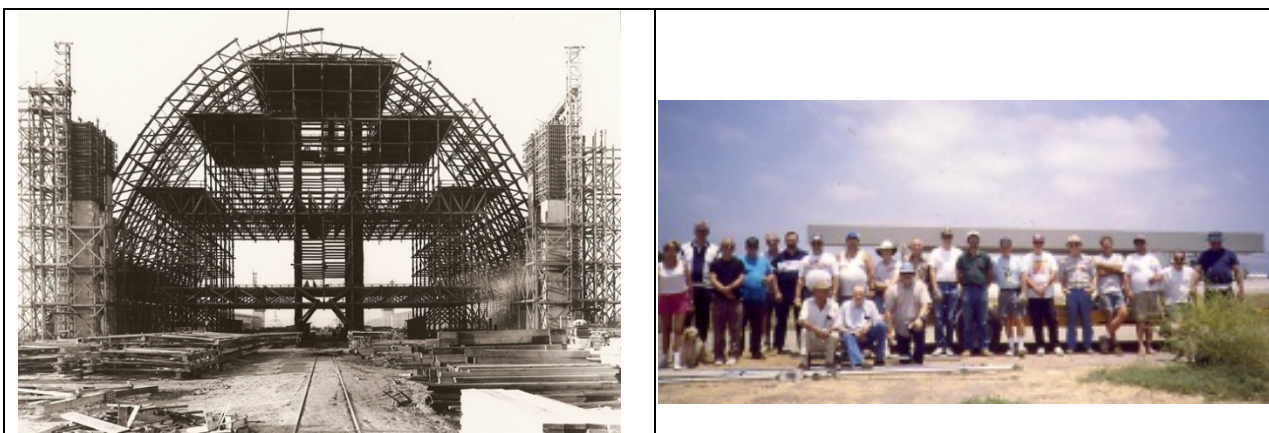
Ken W6HHC says that the Marines really welcomed us. Provided the tents, good food and cold beer!

Huell Howser did a show on MCAS El Toro . Video not working at the moment.

<http://blogs.chapman.edu/huell-howser-archives/1999/10/03/mcas-el-toro-visiting-723/>

### Naval Lighter than Air Station Santa Ana – (MCAS Tustin)

W6ZE Field Days – 1973-1980, 1983, 1984, 1986, 1991-1997



Constructed in 1942; at that time the hangars were the largest free standing wood structures in the world. The blimps patrolled 2000 miles of coastline.

Half of Huell Howser's "Huts and Hangars" show is about MCAS Tustin; fascinating stuff.

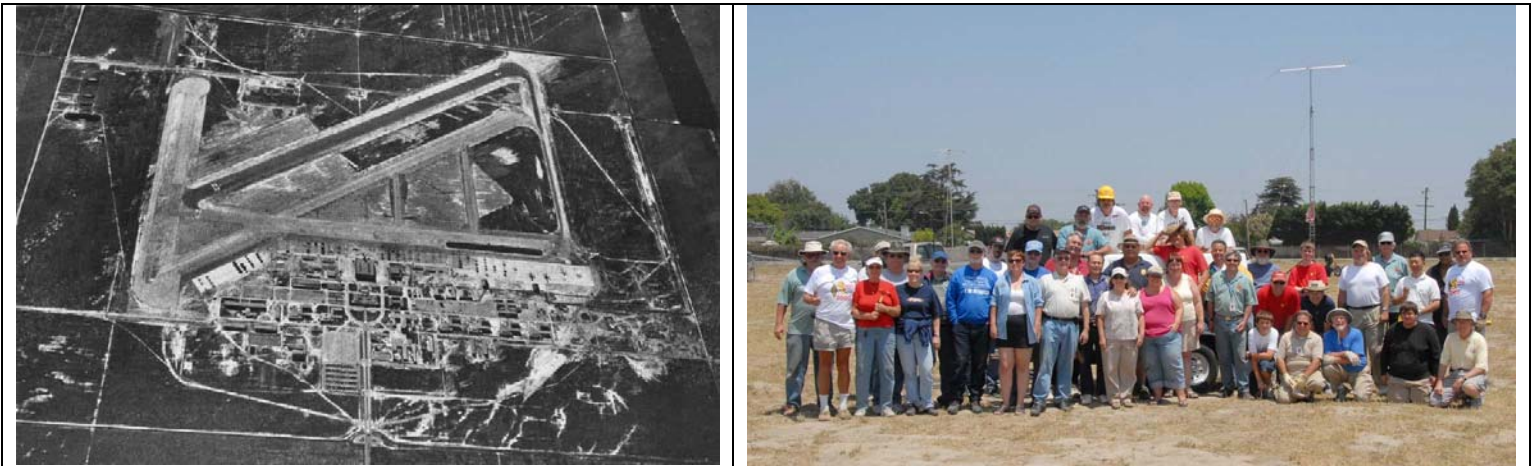
<http://blogs.chapman.edu/huell-howser-archives/1995/12/10/hut-hangers-californias-gold-602/>

The Tustin Area Museum has an excellent site with photos and video:

<http://www.tustinhistory.com/photos-lta.htm>

### Los Alamitos Naval Air Station, Army Airfield, Joint Forces Training Base

#### **W6ZE Field Days – 1972, 2005-2008**



"Los Al" started from a rift between the Navy and the city of Long Beach in the 1930's. This base was an important training base for pilots in WWII. The rest of their history is long and complicated.

[http://en.wikipedia.org/wiki/Los\\_Alamitos\\_Army\\_Airfield](http://en.wikipedia.org/wiki/Los_Alamitos_Army_Airfield)

We had 2 of our previous "super size" Field Days with 9A Class entries in 2007-2008. In 2007 we came in 2<sup>nd</sup> place overall, only 7000 points behind W3AO! Some of the club records we set for QSOs on 40 and 80 meters still stand. We even had a YL only station, complete with pink extension cords.

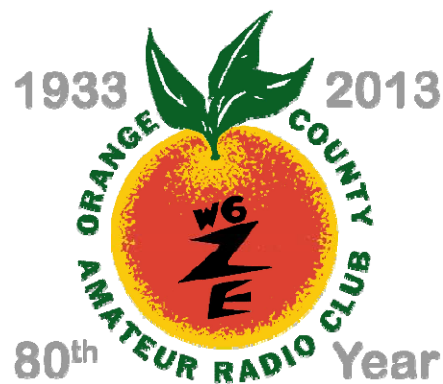
Haster Farm Naval Outlying Field (Garden Grove Park)**W6ZE Field Day 2000**

Like Mile Square Park in Fountain Valley, the Haster Farm Outlying Field was an auxiliary air field for the Los Alamitos Air Station. The airfield was hexagonal shaped. Thanks to Bob AF6C for finding this. The airfield grew with weeds in the 1950s, and the High School and Garden Grove Park were eventually built there.

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In next month's RF, the history of the FCC Primary Monitoring Station Santa Ana and its importance during WWII will be presented. This is where Centennial Park in Santa Ana is now.

*Tim Goeppinger N6GP*





## Heathkit of the Month #50: by Bob Eckweiler, AF6C



### Heathkit EF-2 Oscilloscope Trainer *"How to Understand and Use your... Oscilloscope"*

#### Introduction:

One Heathkit product line I didn't plan on covering was their educational series. I never owned one of their educational kits nor even got close to one - until, that is, a month ago.

Fate delivered a Heathkit EF-2 *"How to Understand and Use Your Oscilloscope"* educational course to my garage. This kit is property of the radio club, donated along with other gear by AC6C/WA6BSV. It will be for sale at, or prior to, the October auction. But for right now I have "borrowed" it to prepare this article!

The EF-2 was first sold in 1962 for \$9.95. It consists of a test chassis you assemble (Figure 1), a bunch of electronic components that you solder special clips to their leads to allow "solderless" breadboarding, and a multi-section manual, that includes an appendix containing a bibliography and glossary. We'll discuss the manual in detail in a later section. The manual uses the Heathkit IO-12 oscilloscope as its basis; the IO-12 oscilloscope was sold between 1962 and 1968. Though the IO-12 is featured, other scopes can be used with the course. The EF-2 was sold stand-alone or bundled with an oscilloscope kit as a package. In the March 1965 catalog (see Figure 2) the bundles offered were the EF-2-3 (\$62.95) which included the 3" IO-21 scope, and the EF-2-4 (\$84.95) which included the 5" IO-12 scope. The manual could also be purchased separately for \$5.00 (\$3.00 if you bought in quantity - assumably for a class). The EF-2 continued to be available until late 1975 when it last sold for \$19.95. In those



**Figure 1: Heathkit EF-2 Oscilloscope  
Trainer Test Chassis**

later years it was also available bundled with some of the then current Heathkit scope models.

In 1962 Heathkit had seven educational kits (eight if you include Heathkit SK-50 Experimenter Electronic Workshop "19"). They were the EF-1 *"How to Understand and Use your Vacuum Tube Voltmeter"* (\$8.95), the EF-2 *"How to Understand and Use your Oscilloscope"* (\$9.95), the EF-3 *"How to Understand and Use your Signal Generator"* (\$11.95), the EK-1 Basic Electricity Kit (\$19.95), the EK-2A Basic Radio kit (Part 1), the EK-2B Basic Radio kit (Part 2) (each \$19.95 plus \$3.95 for the optional cabinet for the completed receiver), and the EK-3 Basic Transistor Kit (\$16.95).

#### The EF-2 Test Chassis:

To get started with the EF-2 oscilloscope trainer, the first step is to assemble the test chassis. The assembly is straight forward and soldering is required. After completing the test chassis, you next prepare numerous electronic components by adding insulation to their leads and attaching spring clips to the end of the leads (Figure 3). You also assemble various lengths of wire jumpers, again with spring clips. The kit comes with three PNP germanium transistors (GE 4JX1C707), various val-



EF-2-3  
\$62<sup>95</sup>

### "How To Understand & Use Your Oscilloscope"

Take the mystery out of using the oscilloscope. Discover how this versatile instrument can help you solve many of your electronic problems. Test chassis with spring-clip components can be re-used practically without limit—excellent for classroom setup. You'll want to make the text a permanent part of your library. The oscilloscope will become your favorite test instrument with the help of this kit.

Kit EF-2, Text and special chassis & parts,  
4 lbs. .... \$9.95

Kit EF-2-3, includes EF-2 and IO-21 3" Oscillo-  
scope, pg. 42, 16 lbs. . . . \$7 dn., \$6 mo.. \$62.95

Kit EF-2-4, includes EF-2 and IO-12 5" Oscillo-  
scope, pg. 42, 28 lbs. . . . \$9 dn., \$8 mo.  
..... \$84.95

**Figure 2: EF-2 and associated bundles from the March 1965 Catalog**

ues of resistors (17), various values of capacitors (9), an earphone (which also acts as a microphone), and a permanent magnet (to demonstrate how a magnetic field affects the scope trace). Additional components are permanently mounted on the test chassis (two potentiometers - 100KΩ and 20KΩ, two binding posts - red and



**Figure 3: EF-2 Clip**

black output terminals, a tapped oscillator coil, and a dual AA battery holder. - mounted beneath the chassis).

#### REAR

(E1) (E2) (E3) (E4) (F1) (F2) (F3) (F4)

(C1) (C2) (C3) (C4) (D1) (D2) (D3) (D4)

(A1) (A2) (A3) (A4) (B1) (B2) (B3) (B4)

#### FRONT

**Fig. 4: Test Chassis Terminal Layout**

The open test chassis measures 6-1/8" W x 9" D x 3" H and has a net weight of 1-1/2 lbs. On it are mounted six terminal strips, each with four non-solder posts. The front panel holds an **OFF ON** slide switch between two potentiometers (20KΩ and 100KΩ), each marked **MIN** at the full CCW end, and **MAX** at the full CW end. The rear panel contains two binding posts marked **OUTPUT** (red) and **GROUND** (black). Mounted on the chassis is a slug tunable tapped oscillator coil (value not given). Under the chassis is a dual AA penlight battery holder that supplies 3 volt power for all the experiments. The **OFF ON** slide switch disconnects the negative lead of the battery supply.

The six terminal strips are mounted front to back in two columns of three rows marked A

A1	100K Pot Min	D1	Post/+3V Gnd (blk)
A2	100K Pot Wiper	D2	free
A3	100K Pot Max	D3	free
A4	free	D4	free
B1	free	E1	Post Out (red)
B2	20K Pot Min	E3	free
B3	20K Pot Wiper	E2	free
B4	20K Pot Max	E4	-3V Power
C1	Coil Low	F1	Post/+3V Gnd (blk)
C2	Coil Tap	F2	free
C3	Coil High	F3	free
C4	-3V DC Power	F3	free

**Table I: Dedicated and Free Posts**





**Figure 5: Spiral Bound Manual**

through F. Each post on a terminal strip is marked 1 through 4. See figure 4.

Fourteen of the 24 terminal strip posts are dedicated to components such as power, ground, the coil and the pots, the other ten are free to be used as tie points. Dedicated posts are listed in Table I. Since this test chassis uses PNP germanium transistors, the power is supplied from the negative battery terminal and the ground binding post and terminal posts are connected to the positive battery terminal.

#### **The EF-2 Manual:**

The manual (Copyright 1962) that comes with the EF-2 contains six parts followed by the appendix. It is 174 pages long, and many of the pages are foldout showing details, waveforms and schematics.

Part I is entitled: *An Introduction to the Oscilloscope*. It is six pages in length giving an over-

view of the oscilloscope and includes one experiment requiring only a scope to perform.

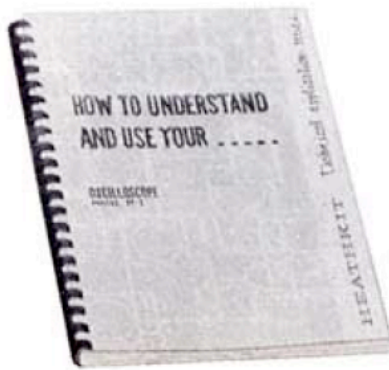
Part II is entitled: *Test Chassis and Parts Assembly*. This is the step-by-step assembly instructions including troubleshooting and warranty information. It also gives instructions for breadboarding up a two transistor audio oscillator on the test chassis. This helps familiarize the user on how to use the test chassis for breadboarding. The oscillator will be used in some of the early experiments in the next section.

Part III is 60 pages long and is entitled: *Basic Principles of Electronics*. It covers: *Electricity - The Flow of Electrons, Ohm's Law, DC and AC, Capacitors, Inductance and Impedance, Semiconductors, Vacuum Tubes and Oscillators* in eight chapters as named above. In this section you will perform 14 experiments as you breadboard different circuits and make measurements on your oscilloscope.

Part IV is entitled: *Oscilloscope theory*. In its five chapters (54 pages) you will study the workings of the cathode ray tube (CRT), the power supply and high voltage CRT circuitry, the sweep circuit, oscilloscope amplifiers, synchronization theory and practical operation. Years ago I read a book published by Tektronix that delved deeply into oscilloscope circuitry and the ways to increase the amplifier response to get a good waveform display at the higher frequencies. While not nearly as in depth as the Tektronix book, the chapter in this Heathkit manual covers many of the more crucial aspects of improving an amplifier's high frequency response. In Part IV you will conduct five experiments including removing the cover from your oscilloscope to explore the different sections. Typical schematics of sections of an oscilloscope are given. Heathkit used the IO-12 oscilloscope for the images as well as the schematic details.

Part V is entitled: *Oscilloscope Maintenance*. It covers the general principles of troubleshooting





## Oscilloscope Technical Applications Course

- A combination experimental chassis & textbook project
- Simplified basic theory written in everyday language
- Interesting experiments performed as you learn
- Solderless spring-clip connectors permit fast, simple circuit changes in experiments
- Big, 100 page textbook remains a valuable reference source
- Ideal for beginners, schools and universities
- Buy with your favorite Heathkit 'scope

Kit EF-2

Figure 6: 1963 Ad for the EF-2 Oscilloscope Trainer Course

as well as making the internal adjustments needed occasionally to keep your scope performing at its best. This part is just two chapters and eight pages.

Part VI is entitled: *Oscilloscope Applications*. Here is where you learn how to use your oscilloscope as a tool. Its eight chapters have the following titles: *Waveform Measurement, Accessories and Special Oscilloscopes, Use of the Oscilloscope in Radio-TV-FM Service Work, Audio and HI FI Applications, Amateur Radio Transmitter Applications for Your Oscilloscope, The Oscilloscope As a Teaching Aid, Waveform Photography, and Medical Applications*. This 28 page section includes numerous waveform drawings as well as alignment and troubleshooting procedures.

Finally the last 5 pages of the manual are an appendix dedicated to a bibliography and glossary of terms.

### Conclusion:

If you work through the manual you will end up not only learning a lot about how to use your oscilloscope and get a good understanding of how the scope works, but you will also receive a good refresher course on electricity and electronic theory.

As you do the experiments in the book you will build an audio oscillator (Figure 7), a radio frequency oscillator, a two-stage audio amplifier, an AM transmitter and more.

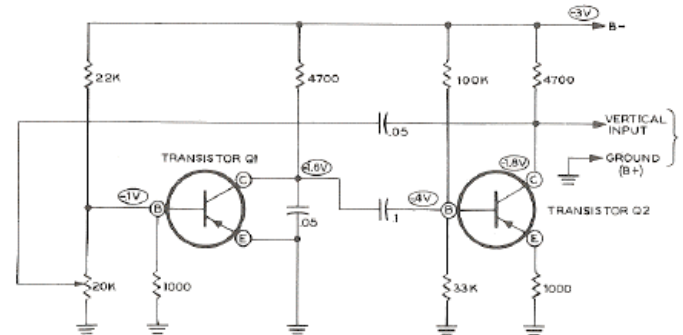


Figure 7: You will breadboard this audio oscillator for the first few experiments

The last ad I could find for the EF-2 was the Winter 1976 catalog (1975/1976). The EF-1 and EF-3 kits continued to be sold. the probable reason for the demise of the EF-2 was two-fold. First, Heathkit began releasing solid-state scopes, making a lot of the course material obsolete; and second, Heathkit was beginning to release a new series of educational kits.

73, from AF6C



*This article is Copyright 2013 by R. Eckweiler and The OCARC Inc.*

*Remember, if you are getting rid of any old Heathkit Manuals or Catalogs, please pass them along to me for my research.*

*Thanks - AF6C*

## TechTalk111

### DATV Testing Report

#### - Part 6 (Bench Test DATV-Express)

by Ken W6HHC and Robbie KB6CJZ

The earlier TechTalk109 presented an overview of the DATV-Express Project efforts and progress to create a lower-cost version of a DigitalATV transmitter exciter board and software. In this TechTalk article we will perform some basic bench tests for the board. W6HHC is again pleased to be joined by fellow OCARC club member Robbie Robinson KB6CJZ for the creation of this TechTalk article on Digital-ATV. Robbie is the club guru on analog ATV and commercial satellite receivers and ham microwave communications in general.

#### The Testing Set-up

**Fig 1** shows the configuration of the set-up used for testing the DATV-Express hardware board as a full-blown DVB-S DATV transmitting station on the 1.2 GHz ham band. Two RF amplifiers were used: a 1 Watt (FM rating) unit by Kuhne and a 30 W (FM rating) by Down East. An old Pentium P4 computer running at 1.8 GHz had the disk drive partitioned to install Ubuntu V12.0.4 32-bit operating system. Qt V5.0.2 with the Qt Creator application was downloaded off the internet to build the software program and graphic user interface (GUI) used by Charles G4GUO to design the software for the DATV-Express project. Although the hardware board and software are designed to generate several DATV protocols (like DVB-S2 and DVB-T) this report only used DVB-S

(with QPSK modulation) as the primary protocol for our testing.

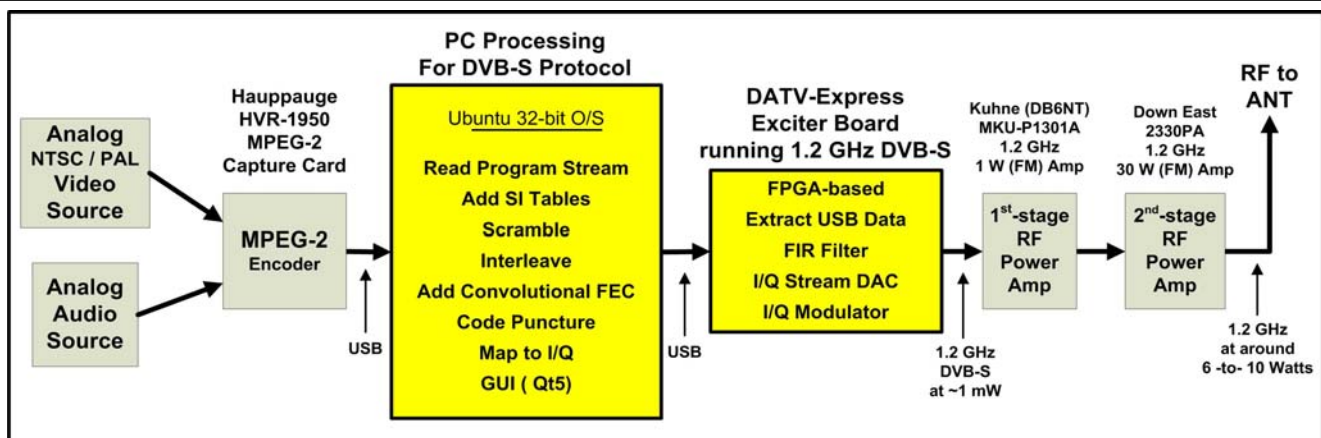
A USB video capture dongle is needed to encode the camera NTSC (or PAL) analog video and audio as highly compressed MPEG-2 data stream for the DATV-Express processing. The video-capture unit used in these tests is the Hauppauge model HVR-1950. Note that Hauppauge uses the designation HVR to mean "hybrid"; indicating that the model includes the capability to capture on-the-air digital-TV (ATSC), as well as analog-TV, as well as analog-camera input.

#### Barefoot Exciter Board Tests

**Fig 2** shows the exciter board. The modulator chip runs very warm (even in non-transmit mode), so Ken added a 1/4-inch aluminum plate to act as a heat-spreader though the four standoffs on the board.



**Figure 2 – The DATV-Express exciter hardware board is fitted with an aluminum plate as a heat-spreader**

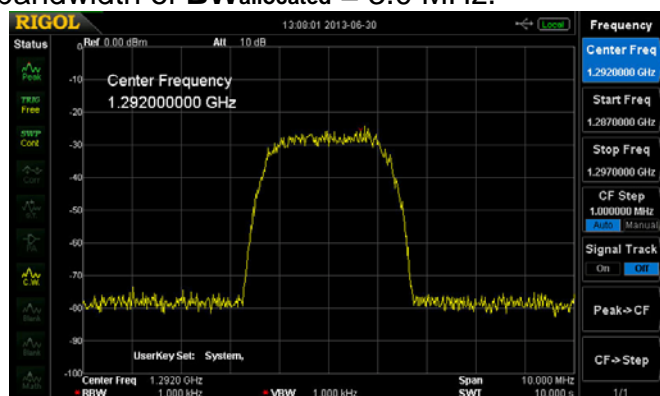


**Figure 1 – Test Set-up for Bench Testing of DATV-Express DVB-S Transmitter**



Ken had an initial problem in that he did not have the firmware for this Hauppauge model on his computer. Charles easily found the correct Hauppauge firmware file on the internet, Ken put the file on his computer....and the Hauppauge unit now loaded the firmware on start up in a Ubuntu environment.

**Fig 3** shows the clean spectrum view of the barefoot DATV-Express exciter board. The output of the Hauppauge MEG-2 encoder is a data-bit-rate of about 2 Mb/s for the normal D1 resolution that is shown on a normal Standard-Definition Digital Television (DVD quality D1 = 720 x 480 Pixel for NTSC). So with the FEC (Forward Error Correction) set to a robust value of 1/2, we used a Symbol-Rate of 2.2 MSymb/sec to provide a compact RF bandwidth of  $BW_{\text{allocated}} = 3.0 \text{ MHz}$ .

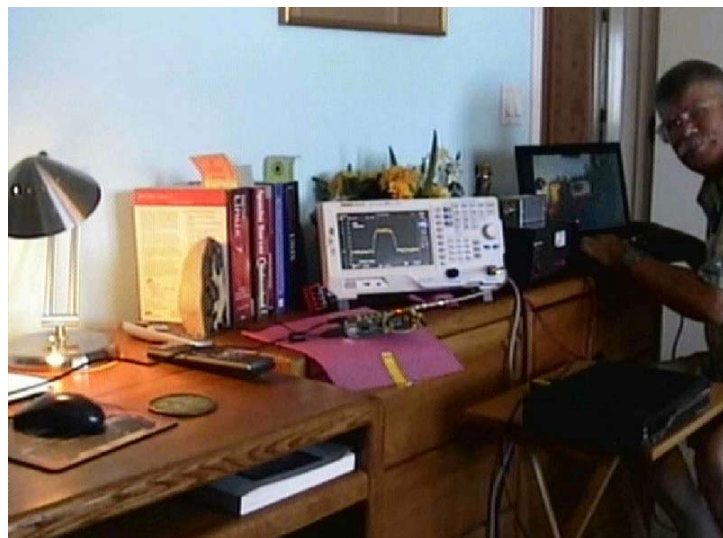


**Figure 3 – A clean DVB-S spectrum of Prototype #4 board running 2.2 MSymb/sec on 1.292 GHz**

Ken was able to look at his new RIGOL Spectrum Analyzer and screen-capture the DVB-S spectrum on 1.292 GHz. This RIGOL is really economical (compared to Agilent and used HP units) and works up to 1.5 GHz.

Ken also had a bit of difficulty with unexpected video-drop-outs on the SetTopBox. Charles G4GUO suspected a buffering problem inside the PC. So Charles prepared a design change to replace the synchronous software buffering design with asynchronous buffering code. Ken re-built the DATV-Express software application with the new source code using Qt Creator and the video-drop-out problem disappeared. The slow Pentium P4 1.8 GHz probably made Ken's testing more susceptible to display the problem than at QTH of G4GUO with his faster PC.

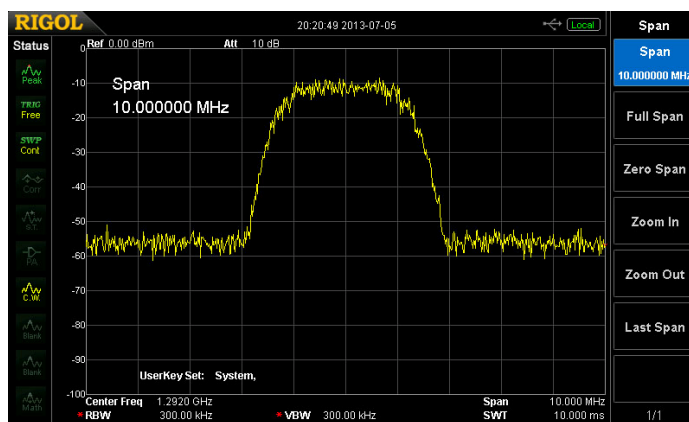
With the video drop-out issue resolved, Ken was able to reliably send DVB-S signals barefoot inside his software lab. **Fig 4** is one of the first DVB-S signals received (using screen-capture on his notebook computer) from across the lab using less than 0 dBm.



**Figure 4 – Early 1.2 GHz DVB-S received video using barefoot DATV-Express to STB to Notebook**

### Tests with First-Stage RF Amp

Robbie provided the needed RF attenuators to protect the input of the Spectrum Analyzer's front end (rated at 30 dBm to create "front end" damage) from the first stage RF amplifier. An external attenuator of 20 dB was used in addition to the spectrum analyzer internal setting of 10 dB of attenuation. No "distortion-shoulders" (also known as "spectral regrowth") ever appeared on the spectrum output of the Kuhne RF amplifier, with the DATV-Express RF output set to a very high value of 40 (out of 47 levels). The photo in



**Figure 5 – Clean DVB-S spectrum on 1.2 GHz using DATV-Express with Kuhne P1301A RF Amp**

**Fig 6** shows Robbie KB6CJZ inspecting the test set-up for measuring the spectrum output of the first-stage Kuhne RF amplifier.





Figure 06 – KB6CJZ is shown after connecting an external 20 dB attenuator from Kuhne RF amp

### Tests with Second-Stage RF Amp

Fig 7 shows the Down East model 2330PA RF amplifier that is rated at 30W on FM and can develop about 6-to-10 Watts of output using QPSK digital modulation on 1.2 GHz band.



Figure 7 – The Down East RF Power Amp is connected to the Spectrum Analyzer through an external 40 dB of attenuation

For the testing with the Down East amplifier, external attenuators totaling 40 dB were used in addition to the spectrum analyzer internal setting of 10 dB of attenuation. Fig 8 shows the spectrum for the second-stage RF amp output when the DATV-Express RF output drive setting was equal to a value of 30.

A table of measurements is provided as Table 1 that lists the outputs obtained at different levels of power drive settings.

### Measuring Power

There are three basic approaches to measuring power for DATV output:

1. Power meter – the most straight forward approach is to use a dedicated power meter that uses a thermal head. All hams seem to agree that the old faithful HP Model 432 is a good choice for DATV.
2. Power-capable Spectrum Analyzer – expensive industrial grade come with a special mode to measure and display channel power directly for digital modulations (such as Tektronix RSA5000).
3. Normal Spectrum Analyzer – Mike WA6SVT explained to Ken to set the RBW and VBW on the

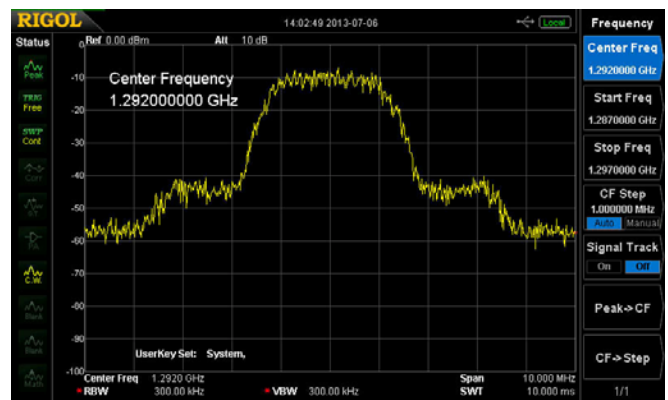


Figure 08 – Spectrum using Down East amplifier shows “shoulders” are developed but down about 32 dB. (DATV-Express power setting is 30)



Figure 09 – Stray RF from Bench Test set-up provided easy DATV Signal Reception on the STB. (Notebook screen-capture of W6HHC)

Spectrum analyzer to same width as the RF “occupied bandwidth”. The power is the top-of-the haystack. Ron W6RZ and Rob MØDTS have pointed out to us that you can use a little math to calculate the power level from the value at the top-of-the-haystack if the spectrum analyzer does not have a wide-enough bandwidth setting.. The correction factor in dB to add to the haystack value is:

$$10 \cdot \log_{10} (\text{channel bandwidth} / \text{resolution bandwidth}).$$

One aspect of power amplifiers that always surprises newcomers to Digital-ATV is that DATV can NOT achieve the same average power out of an RF amplifier as FM modulation can. This is because most digital modulation technologies (except GMSK) have a very high “peak-to-average ratio”. In order to prevent DATV distortion, you need to reduce the drive so that the peaks do not go into compression or flat-topping. On the web site from Alberto (DGØVE) you can read (in German): “All amplifiers can also be used for DVB-S and DVB-T with reduced power. You will notice that in the DVB-S mode only about 20% to 25% of the maximal power (P-1dB) can be used. Working in the DVB-T mode you will get only approximately 8% to 10% of the P-1dB power level.”

Table 1 - Measurements taken during DATV-Express DVB-S Transmitter Bench Testing

DATV-Express exciter Menu Power-setting	Kuhne first-amp spectrum level	Spectrum Analyzer RBW setting	"distortion shoulder" below main carrier	Down East 2nd-amp spectrum level	Spectrum Analyzer RBW setting	"distortion shoulder" below main carrier	Down East Power Measurement (HP 432A) Output dBm	Down East Power Measurement (HP 432A) Output W
20	- 2 dBm	300 KHz	NONE				N/A	
30	+ 7 dBm	300 KHz	NONE				N/A	
40	+ 18 dBm	300 KHz	NONE				N/A	
46	+ 25 dBm	300 KHz	- 34 dB				N/A	
The above spectrum reading values account for 30 dB attenuation								
20	N/A			+ 32 dBm	300 KHz	NONE	N/A	
25	N/A			+ 38 dBm	300 KHz	- 35 dB	N/A	
30	N/A			+ 41 dBm	300 KHz	- 32 dB	36.3 dBm	4.3 W
33	N/A			+ 42 dBm	300 KHz	- 30 dB	38.8 dBm	7.6 W
35	N/A			+ 45 dBm	300 KHz	- 28 dB	40.3 dBm	10.7 W
The above spectrum readings account for 50 dB attenuation								

## Software GUI

The current DATV-Express software User Interface is very simple, but it allows the user to easily configure each of the supported protocols (aka modes) to the desired settings such as: frequency, modulation type, FEC, Symbol Rate, and power level. The TABs along the top of the screen shown in **Fig 10** are set up for DVB-S, DVB-S2, DVB-T, and DVB-T2 protocols. No code has currently been developed for DVB-T2, so the GUI TAB is just a "holding place". Since DATV-Express uses a Software Defined Radio approach, other interested hams could develop software for other protocols such as ITU-T\_J.83-Annex-B or DVB-C, etc.

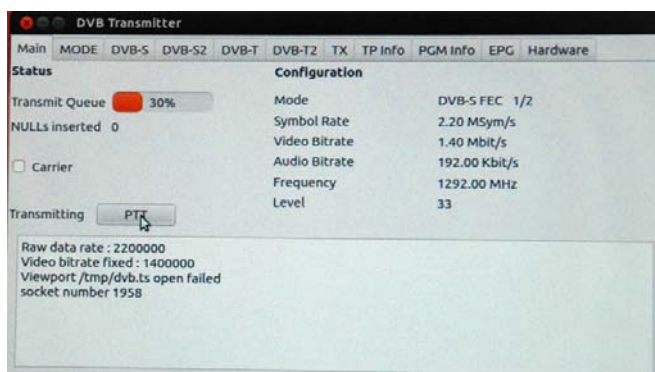


Figure 10 – DATV-Express software User Interface configured for DVB-S Protocol

## Summary and Plans

The bench testing shows that the DATV-Express software and hardware board produce a very clean DVB-S signal. In our opinion, the signal quality appears to be as good as those we have measured with the MiniMod DVB-S boards produced by SR-Systems in Germany. As explained before, DATV-Express is capable of other DATV protocols used by ham radio. **Fig 11** shows the board generating a DVB-T protocol signal using 2 MHz BW with QPSK digital modulation.

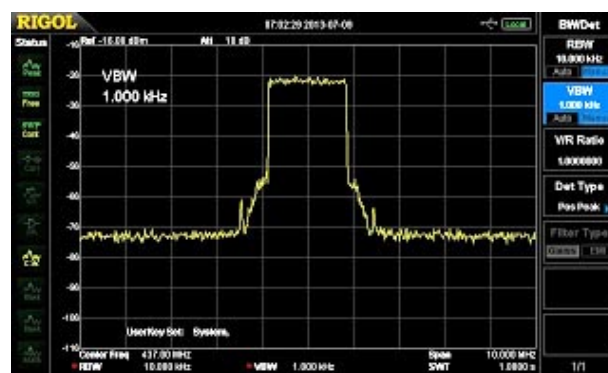


Figure 11 - Spectrum of DATV-Express board running 2 MHz wide DVB-T Protocol on 437 MHz (Courtesy of G4GUO)

Ken and Robbie plan to do some DATV testing between our homes in the near future (flat and only 5 miles, but lots of buildings, elevated freeways, and tall trees).

## Interesting DATV URLs

- YouTube Video on DATV-Express board – see <http://youtu.be/OXh-anABYaU>
- British ATV Club - Digital Forum – see [www.BATC.org.UK/forum/](http://www.BATC.org.UK/forum/)
- Yahoo Group for Digital ATV - see [groups.yahoo.com/group/DigitalATV/](http://groups.yahoo.com/group/DigitalATV/)
- Orange County ARC entire series of newsletter DATV articles – see [www.W6ZE.org/DATV/](http://www.W6ZE.org/DATV/)
- DigiLite Project for DATV (derivative of the "Poor Man's DATV" design) see [www.G8AJN.tv/dlindex.html](http://www.G8AJN.tv/dlindex.html)
- Rigol Model DSA815-TG Spectrum Analyzer – see [www.RIGOL.com](http://www.RIGOL.com)
- SR-Systems D-ATV components (Boards and complete XMTR) – see [www.SR-systems.de](http://www.SR-systems.de)
- TAPR 2012 Digital Comm Conf (DCC) Proceedings on "DATV-Express - a Project Update" see [www.TAPR.org/pub\\_dcc31.html](http://www.TAPR.org/pub_dcc31.html)
- CQ-DATV online (free bi-monthly) e-magazine – see [www.CQ-DATV.mobi](http://www.CQ-DATV.mobi)

## OCARC GENERAL MEETING MINUTES 2013-06-14

The OCARC General Meeting was held at the Red Cross Complex on June 14<sup>th</sup> 2013. This was a week earlier than normal due to Field Day being the next weekend. The meeting was called to order at 7:04 pm.

Prior to the start of the meeting, Jeff Hall, W6UX, led another Field Day SSB operator training session. This was the last session offered by Jeff prior to Field Day. Everyone who attended felt well prepared. Thanks Jeff.

Nickolas, AF6CF, quickly dispensed with pleasantries and introduced Tim N6GP for a History Minute entitled "World War 2 and OCARC Field Days". Tim provided a briefing on how many of the sites that the club has used for Field Days over the years were military installations first developed during the war years. One of the interesting sites was Centennial Park in Santa Ana that actually severed as an FCC monitoring station and then many years after the war became the park and school site that it is today.

The main speaker for the evening was Chip Margelli – K7JA. The focus of Chip's talk was to get us ready for Field Day. Chip kept us entertained and informed and ready to win that darn contest!

At 8:00 pm a break was called and then shortly after the break our "opportunity drawing" was held. At that point our regular meeting was ending and a final session of the Field Day committee planning meeting was begun.

Bob Harrington ran down the check list of details that are in the works for Field Day. It appeared that everything was in order and under well planned control. There was a general sense of expectation for the event.

Meeting adjourned at 9:10pm.

Respectfully submitted by:  
*Tim Millard, KJ6NGF, Secretary 2013.*



### Selected upcoming Special Event Stations (Source: [www.arrrl.org](http://www.arrrl.org))

**07/19/2013** | 90th Anniversary of the Frederic Remington Art Museum  
Jul 19, 1300Z-2300Z, W2R, Ogdensburg, NY. Frederic Remington Art Museum. 28.350 24.950 21.300 14.325. Certificate. Martin Dempsey, 123 CR 4, Ogdensburg, NY 13669. [www.fredericremington.org](http://www.fredericremington.org)

**07/20/2013** | Winnebago-Itasca Travelers Grand National Rally  
Jul 20-Jul 21, 1500Z-2100Z, W0WIT, Forest City, IA. WIT Radio Club. 14.268 7.253 147.27+. QSL. Attn: Lois Maas, 3700 S Westport Ave #2242, Sioux Falls, SD 57106. [www.orgsites.com/ia/witcars](http://www.orgsites.com/ia/witcars)

**07/22/2013** | W9IMS Brickyard 400 Special Event  
Jul 22-Jul 28, 2300Z-2200Z, W9IMS, Indianapolis, IN. Indianapolis Motor Speedway Amateur Radio Club. 21.350 14.245 7.240 3.840. Certificate & QSL. IMS ARC, PO Box 30954, Indianapolis, IN 46230. [w9ims.org](http://w9ims.org)

**07/27/2013** | 4th Annual Detroit Maker Faire at The Henry Ford  
Jul 27-Jul 28, 1300Z-2100Z, K8UTT, Dearborn, MI. Ford Amateur Radio League. SSB: 28.400 14.250 7.270 3.900; CW: 28.170 14.130 7.100 3.550. Certificate. FARL, PO Box 2711, Dearborn, MI 48123. . 10 20 40 80 m, satellite attempts will be made. [www.k8utt.org](http://www.k8utt.org)

**08/04/2013** | Colorado 14er and Summits On The Air (SOTA) Event  
Aug 4, 1500Z-2300Z, KV0CO, Pikes Peak, CO. Colorado 14er Event Task Force. 147.42 446.0 14.060 14.260. QSL. QSL to station, worked, Pikes Peak, CO 80809. Radio hams operate from the 14,000 foot mountains AND the SOTA peaks in Colorado. Many stations will be on the air from multiple summits, including Summits On The Air summits. QSL to the station contacted. For more information [www.14er.org](http://www.14er.org)



## OCARC Board Meeting Minutes

**June 8, 2013**

The OCARC Board meeting was held at the JagerHaus Restaurant, 2525 East Ball Road, Anaheim, and called to order by President Nicholas Haban AF6CF on Saturday, May 11, 2013. Called to order at 8:18 am and all directors except Jay – KI6WZU, Kris – KC6TOD, Bob – AF6C and Paul – W6GMU were present.

### DIRECTOR REPORTS

**Treas** –Ken W6HHC reports for the calendar year our accounts are up \$1300 after subtracting outflows from inflows. Also, the FD food donation can is up to \$175. Ken W6HHC will miss the club meeting on June 14 (social engagement) and will turn the checkbook and donation can over to Tim N6GP.

**Secr** –.

**Activities** – Doug W6FKX will not be at the June meetings. Jeff Hall will run the Opportunity drawing at the June meeting.

**Publicity** – Kris KC6TOD has copy of a “General News Release” to send out to various news agencies regarding our Field Day activities. Kris is also working on a plan to invite Buena Park PD personal to attend our Field Day.

### Old Business:

**June General Meeting** – Chip Margelli to present a FD presentation, meeting will also include a FD related historical minute.

**Newsletter Editors:** Jun – W6HHC; Jul – W6GMU; Aug – AF6C; Sept – N6GP; Oct – KC6TOD; Nov – W6FKX; Dec –KC6TOD.

**General Meeting Entertainment** – June – Chip will be making Field Day related presentation. July Arduino and Picaxe author Bill Pratts – K6ACJ. Ken – W6HHC doing a presentation at the August meeting, September – Party, October – Auction, November – Doug W6FKX on Long Beach Earthquake plus Ham Radio response. December – Dinner.

### Field Day

Bob Harrington reported that all things seems to be coming together well.

**Field Day Banner** - The banner was shown to the membership at the last general meeting. Bob – AF6C is planning on having additional signs around the site.

**Field Day Public Relations Officer** – Hospitality/Welcome Tent is covered.

**Field Day Food Donation Can.** Money has started to be donated into the can with \$175 received as of 6/8/13. Kris- KC6TOD is handling the menu for food.

**Preliminary Field Day Budget** – estimated budget so far is around \$2000 with hopefully \$1100 covered by donations. Firmer cost numbers are still being gathered.

**Logo items for sale** - This item is tabled until July.

**PayPal Account reestablishment** – Further action tabled until July.

**September Reunion** – This item is tabled until after Field Day.

### New Business:

1. **FD Safety concerns** – Arnie will be asked for his advice regarding having proper First Aid station coverage. Also, mentioned that Boy Scouts are often First Aid trained.
2. **Show and tell during the General Meeting** – Any and all members are encouraged to consider bring an item for show and tell.

### Good of the Club

Adjourned at 9:07 am

Respectfully submitted by:  
*Tim Millard KJ6NGF*, Secretary 2013.



## Western Amateur Radio Association

### NOW OFFERING AMATEUR RADIO VE TESTING SESSIONS

Contact V.E. George T. Jacob Jr. N6VNI  
Phone Numbers: Home 562 691 7898 Cell 562 544 7373  
Email: [jac2247@gmail.com](mailto:jac2247@gmail.com) Or [N6VNI@arrl.net](mailto:N6VNI@arrl.net)

Sponsoring Club: N6ME Western Amateur Radio Association, Fullerton, Ca. "WARA"

Test site location:

La Habra Community Center.  
101 W. La Habra Blvd.  
La Habra, Ca. 90631

Date and Time:

Third Thursday of every month, @ 6 P.M. unless otherwise noted

Pre-Registration is requested and preferred.

Walk-ins are welcome.

**UPCOMING SESSIONS:**

Thursday, July 18<sup>th</sup>, 2013 – 6pm  
Thursday, August 15<sup>th</sup>, 2013 – 6pm  
Thursday, Sept. 19<sup>th</sup>, 2013 – 6pm  
Thursday, October 17<sup>th</sup>, 2013 – 6pm  
Thursday, November 21<sup>st</sup>, 2013 6pm

Thanks to Allan R. Mansoor, Assemblyman for the 74th District, the California Legislature recognized the Club's efforts (and several of its individual members) for their participation in the 2013 ARRL Field Day event

C A L I F O R N I A   L E G I S L A T U R E



CERTIFICATE OF RECOGNITION

PRESENTED TO


*Orange County Radio Club*  
*W6ZE*

IN HONOR OF YOUR SERVICE AND SUPPORT OF THE

*Orange County Amateur Radio Club*  
*80<sup>th</sup> Anniversary Field Day Event*

*Proudly presented this 22<sup>nd</sup> day of June, 2013*



  
ALLAN R. MANSOOR  
ASSEMBLYMAN  
74<sup>TH</sup> DISTRICT